

SCIENCE

NEW YORK, APRIL 22, 1892.

THE LOAN COLLECTION OF OBJECTS USED IN WORSHIP.

THE ceremonies at the opening of the Loan Collection of Objects used in Worship at the Museum of Archæology of the University of Pennsylvania took place on the afternoon of the 16th of April, in the large hall of the library building, in the presence of a large audience of invited guests and members of the University Archæological Association. Addresses were made by Dr. William Pepper, provost of the University, the Rev. John S. MacIntosh, D.D., LL.D., the Rev. Dr. Marcus Jastrow, and Mr. Charlemagne Tower, president of the Department of Archæology. Dr. MacIntosh, in his address entitled "Musings in the Pantheon of the East," dwelt upon the evidences of the unity of the human race to be found in the various religions represented in the collection. Dr. Jastrow, in conclusion, said, "Few in number as yet are the universities which have endowed chairs for the history of religions; a beginning has been inaugurated by which to interest American thought in this special work. Collections of religious emblems like the one we are about to open to-day contain the way-marks on the roads and by-ways which the human family has been taking up to this day. As yet there exists in the world only one museum where these way-marks can be studied; it is the Musée Guimet in Paris. And our collection here is the first attempt of the kind in our country."

The collection is divided into sections, each of which was either arranged and described by a special student, or by the curator with the aid of native oriental scholars. Each section of the catalogue, a closely-printed octavo of 174 pages, is prefaced by a sketch of the religion to which it refers, while the details regarding each object comprised in the 794 catalogue entries are given in appended notes. The sections comprise Religions of Ancient Egypt, by Mrs. Cornelius Stevenson; Religions of India: Vedism, Brahmanism, Buddhism, and Jainism, to which Suamee Bhaskara Nand Saraswatee of Jodhpur lent valuable assistance; Religions of China, divided into the State Religion, Confucianism, Worship of Ancestors, Taoism, Buddhism, and Thibetan Buddhism, arranged with the aid of scholarly Chinese; The Religion of the Chinese in the United States, under which is to be found an almost complete collection of the idols, shrines, amulets, implements for divination, with incense, paper money, and offerings used by our Chinese residents, including two practical shrines with all of their appurtenances, one of the God of War and the other the shrine erected at the New-Year; Religions of Japan: Shintoism and Buddhism, collated with the aid of resident Japanese students; Moham-medanism, by Dr. Morris Jastrow, professor of Arabic in the University of Pennsylvania; Native American Religions, comprising the North-west Coast, United States, Mexico, Yucatan, San Domingo, and Peru, by Dr. Daniel G. Brinton; Religions of Polynesia, by Dr. Brinton; Religions of the Baulu Tribes of Africa, by Rev. Dr. Robert Hamill Nassau;

and, in conclusion, a section devoted to charms and amulets.

The collection represents forty-five individual donors and lenders, besides several institutions and societies, including the Smithsonian Institution, Washington, D.C., the Numismatic and Antiquarian Society of Philadelphia, and the Board of Foreign Missions of the Presbyterian Church in the United States, whose Missionary Museum constitutes the nucleus of the exhibition. The plan of the Musée Guimet has in general been followed, but the collection has a much wider range than the great Paris museum, although inferior to it in point of intrinsic value and artistic beauty of the specimens, every object in the Guimet Museum being a gem.

The educational value of the collection has been the first thing considered, and whatever are its deficiencies, it is highly suggestive throughout, and an endeavor has been made to supply the notable gaps by means of notes in the catalogue.

The exhibition has been the means of bringing to light many objects of scientific importance, whose possessors were unaware of their significance and value, and making them available for the purposes of study. It marks an event in the history of scientific work in its special field in Philadelphia, where the study of the history of religions, the object of a highly successful course of lectures during the past winter under the auspices of the University Archæological Association, has lately received much attention.

THE BROOKLYN INSTITUTE BIOLOGICAL LABORATORY.

THE location of the Biological Laboratory, at the head of Cold Spring Harbor, is one of the most favorable on the coast. The country around is high and rolling, with abundant forests, glens, and small streams, affording most excellent hunting ground for every form of animal and vegetable life common to our climate. Just above the laboratory is a series of three fresh-water ponds, each fertile in its own peculiar forms of fresh-water life, and through which flows the water of Cold Spring Creek. Just below the Laboratory is the harbor of Cold Spring, divided by a sandy neck into an inner and an outer basin. These basins afford a great variety of marine life, and the channel between the inner and outer basins has a varied and vigorous growth of algæ, molluscs, and echinoderms. The outer basin has shallow flats, banks, and eel grass, sheltered pools, oyster-beds, and other favorable conditions for collection and study. The outer basin opens widely into Long Island Sound, whose coast is exceedingly varied in character for twenty miles in either direction.

The main Laboratory occupies the first floor of the New York State Fish Commission Building, and is a room thirty-six feet wide and sixty-five feet long, provided with ample light from every side. It is furnished with laboratory tables, aquaria, hatching-troughs, glassware, and all the apparatus and appliances required for general biological work. Into the Laboratory is conveyed a bountiful supply of the water

of the Cold Spring for use in the aquaria and troughs. This water is pure, has the same low temperature throughout the year, and is the water used so successfully by the New York State Fish Commission in hatching and growing salmon, trout, and other food fishes. The Laboratory is also supplied with an abundance of salt-water, which is pumped up from the harbor into a reservoir, from which it runs into the Laboratory.

The station is provided with two small row-boats and a naphtha launch, together with nets, trawls, and dredges for use in collecting and dredging. The main Laboratory is furnished with both fresh and salt-water aquaria, with a Becker microtome and a Minot microtome, together with many smaller instruments and appliances. Near the main Laboratory is a photographic room, with a dark room and a work-room adjoining. These rooms are provided with a general photographic outfit, a photomicrographic apparatus, a heliostat, and the necessary appliances for practical photography.

Each student is provided with dissecting instruments, chemicals, and glassware to be used in the dissection, preparation, and study of tissues. Students who own microscopes, or who can borrow them for the summer, are respectfully requested to bring them to the Laboratory for their own individual use. Microscopes will be provided for those students who cannot provide themselves with instruments.

The New York Fish Commission very kindly grants the use of the main Laboratory room for biological study during the summer months, when it is not required by the work of the Commission.

The other buildings and the grounds used by the Biological Laboratory are the property of the Wauwepec Scientific Society of Cold Spring Harbor, and the use of them is generously donated by the Society for the benefit of the instructors, specialists, and students who are in attendance at the Laboratory.

A general course in biology adapted to meet the wants of those who desire to obtain a general and working knowledge of biology either for use in teaching or in preparation for special work will be given during the first six weeks of the session. It will consist primarily of laboratory study of specimens illustrating leading types of animal life. The practical work will be accompanied by lectures giving an outline of systematic zoology, for the purpose of showing the relations of the forms studied to other animals. The lectures will also touch upon various matters of general biological interest. The types studied will comprise forms of life represented in the waters of Long Island Sound.

Accompanying this course of laboratory work and lectures, instruction will be given in methods of mounting objects and in the preparation of microscopic sections. Opportunity will also be given for collecting and surface skimming.

A special feature of the Laboratory will be an extended course in the methods of bacteriological research. The course will consist of laboratory work on the culture and propagation of bacteria, the identification of species, and of lectures and demonstrations by the director. The number of students admitted to this course is limited, and only those who are well prepared by previous study and experience in biological or medical work will be admitted to the course.

Students who pursue the general course of instruction during the summer, and who have time for extra work, are given the instruction and facilities necessary to enable them to carry on special investigations, while those students who have already gained the knowledge and experience which is provided by the general course, will be permitted to give

their entire time to special work. No special courses will be laid down in advance, but each student will be at liberty to arrange with the director of the Laboratory for such a course or courses as may be practicable.

Each lecturer will be provided with extra laboratory space in which to carry on his own private investigations so long as he shall remain at the Laboratory, and will not be called upon to give any instruction outside of his lectures and such directions for work as may accompany his lectures.

The Laboratory will open for the season on Wednesday, July 6. The regular session for students will continue from that date until Wednesday, Aug. 31.

The tuition fees will be, — for the full term, eight weeks, \$25; for the first six weeks, \$20; for the first four weeks, \$15; for the last four weeks, \$15.

The tuition is payable \$10 on registration as a student, and the balance during the first week of attendance. Each student will be entitled to attend all the lectures delivered at the Laboratory, to the use of the Laboratory and its appliances, subject to the regulations established by the director and board of managers, and to all the facilities for collecting specimens which are possible with the launch and other boats provided by the Laboratory.

The number of students for the season of 1892 is limited to thirty. The Board of Managers reserve the right to admit as students only those whose training qualifies them to make the best use of the Laboratory and its facilities for study and research. Applicants for admission to the Laboratory should state what work in botany or zoology they have already done, and what course they would like to pursue the present season.

A good reference library will be placed at the service of students, and a collection of algæ will serve to guide students in marine botany. In addition to the regular lectures given in connection with the laboratory work, evening lectures will occur two or three times a week, illustrated by the aid of a magic lantern. The lantern is provided with a vertical attachment and with large and small cells, in which forms of life may be placed and their structure exhibited on the screen. A microscopic attachment to the lantern will enable lecturers to demonstrate points in minute anatomy, and a large collection of lantern slides of biological subjects will furnish the means for comparison of many allied forms and structures.

The evening lectures will be open to the public, and persons interested may secure admission to the entire course.

Arrangements have been made with residents at Cold Spring Harbor to provide very good and comfortable rooms, with board, a few minutes' walk from the laboratory, at rates varying between six and eight dollars per week.

A new dining-room has been provided close by the Laboratory, and excellent board will be provided to such officers and students as may choose to avail themselves of it at \$5 per week. It is expected that a majority of the officers and students will board at the dining-room and take rooms at the residences near by. The expense in this case will be as before, between seven and ten dollars for board and room.

Accommodations can be secured at either of the large, excellent, and quiet hotels that overlook the harbor, and are fifteen minutes' ride by boat or carriage from the Laboratory, at rates varying between eight and fifteen dollars per week, according to the size and location of rooms. The hotels are known as the Glenada, Laurelton, and Forest Lawn.

Full information will be given concerning rooms and board to anyone who signifies an intention of becoming a

student at the laboratory, and both board and room may be engaged in advance by application to the director of the Laboratory.

For further particulars inquire of Professor Franklin W. Hooper, Brooklyn Institute of Arts and Sciences, N.Y., or of Professor Herbert W. Conn, Wesleyan University, Middletown, Conn. Applications for admission as students should be sent to the Institute.

THE MARINE BIOLOGICAL LABORATORY.

THE corps of instructors this year consists of Dr. C. O. Whitman, director, professor of zoology, Clark University; editor of the *Journal of Morphology*; H. C. Bumpus, associate professor of zoology, Brown University; E. G. Conklin, professor of biology, Ohio Wesleyan University; Pierre A. Fish, instructor in physiology and anatomy, Cornell University; Jacques Loeb, professor of physiology, Bryn Mawr College; W. A. Setchell, instructor in botany, Yale University; Sho Watase, assistant in animal morphology, Clark University; W. M. Wheeler, assistant in animal morphology, Clark University; Ryoiche Takano, artist; G. M. Gray, laboratory assistant; J. J. Veeder, collector.

In addition to the regular courses of instruction in zoology, botany, and microscopical technique, consisting of lectures and laboratory work under the direct and constant supervision of the instructors, there will be a number of lectures on special subjects by members of the staff. A course of lectures in embryology will be given by Professor Whitman; in biological physiology, by Dr. Loeb; and two or more courses in invertebrate zoology, by Dr. Bumpus and Dr. Wheeler.

There will also be ten or more evening lectures on biological subjects of general interest. Among those who may contribute these lectures and take part in the discussions upon them may be mentioned, in addition to the instructors above named, the following: Dr. H. Ayers of the Lake Laboratory; Professor H. H. Donaldson, Clark University; Professor William Libbey, Jun., Princeton College; Dr. Warren P. Lombard, Clark University; Professor Charles Sedgwick Minot, Harvard Medical School; Professor E. S. Morse, Salem; Professor H. F. Osborn, Columbia College; Professor W. T. Sedgwick, Massachusetts Institute of Technology; Professor E. B. Wilson, Columbia College.

The Laboratory is located on the coast at Wood's Holl, Mass., near the Laboratories of the United States Fish Commission. The building consists of two stories — the lower for the use of teachers and students receiving instruction, the upper exclusively for investigators. The Laboratory has aquaria supplied with running sea-water, boats, a steam launch, collecting apparatus, and dredges; it is also supplied with reagents, glassware, and a limited number of microtomes and microscopes. By the munificence of friends the library will be provided henceforth not only with the ordinary text-books and works of reference, but also with the more important journals of zoology and botany, some of them in complete series.

The Laboratory for investigators will be open from June 1 to Aug. 30. It will be fully equipped with aquaria, glassware, reagents, etc., but microscopes will not be provided. In this department there are twenty-four private laboratories supplied with aquaria, running water, etc., for the exclusive use of investigators.

Owing to the growth of the Laboratory and the great de-

mand for tables, the trustees have voted to enlarge the present building so that a spacious new wing will be ready for use on July 1. Those who are prepared to begin original work, but require supervision, will occupy tables in the general laboratory for investigators, paying for the privilege a fee of fifty dollars. The number of such tables is limited to ten. An elementary course in investigation will be introduced this season, designed to meet the needs of those who have completed the general courses in the Students' Laboratory. Definite problems of limited scope will be assigned and worked out as a means of training in the ways and methods of research. The fee for this course also will be fifty dollars, and the number of tables will likewise be limited to ten. For the completion of any considerable piece of investigation, beginners usually require from one to three full years. It is not expected, therefore, that the holders of these tables will finish their work in a single season. The aim is rather to make a secure beginning, which will lead to good results if followed up between sessions, and renewed, if need be, for several successive years.

The Laboratory for teachers and students will be opened on Wednesday, July 6, for regular courses of seven weeks in zoology, botany, and microscopical technique. The number admitted to this department will be limited to fifty, and preference will be given to teachers and others already qualified. By permission of the director, students may begin their individual work as early as June 15 without extra charge, but the regular courses of instruction will not begin before July 6. Though more advanced students who may wish to limit their work to special groups will have an opportunity to do so, the regular course in zoology, in charge of Professor Bumpus, will embrace a study of the more typical marine forms and elementary methods of microscopical technique. Mr. W. A. Setchell will have charge of the work in botany. The tuition fee is thirty dollars, payable in advance. Applicants should state whether they can supply themselves with simple and compound microscopes. Microscope slides, dissecting and drawing instruments, bottles, and other supplies, to be finally taken from the Laboratory, are sold at cost. Further information, if desired, may be had by addressing Professor Hermon C. Bumpus, Wood's Holl, Mass.

Applications for places in either department should be addressed to Mrs. Anna Phillips Williams, secretary, 23 Marlborough Street, Boston.

Rooms accommodating two persons may be obtained near the Laboratory, at prices varying from \$2 to \$4 a week, and board from \$4.50 to \$6. By special arrangement, board will be supplied to members at The Homestead at \$5 a week.

A Department of Laboratory Supply has been established in order to facilitate the work of teachers and others who desire to obtain materials for study or for classes. It is proposed to furnish, e.g., certain sponges, hydroids, starfishes, sea urchins, marine worms, crustaceans, mollusks, and vertebrates, preserved in good condition, at fair prices. Orders for the coming college year should be given as soon as possible. Circulars giving information, prices, etc., may be obtained by addressing the Department of Laboratory Supply, in care of the secretary.

Wood's Holl, owing to the richness of the marine life in the neighboring waters, offers exceptional advantages. It is situated on the north shore of Vineyard Sound, at the entrance of Buzzard's Bay, and may be reached by the Old Colony Railroad (2½ hours' from Boston), or by rail and boat from Providence, Fall River, or New Bedford. Persons going from Boston should buy round-trip tickets (\$2.85).

The annual report of the trustees, containing an account of the organization and work of the Laboratory, may be obtained from the secretary.

HOMOPTERA INJURIOUS TO GRASSES.

AMONG the many insects that are destructive to the grasses the little leaf-hoppers take a very prominent place, and the writer is of the opinion that, although their work is often or for the most part entirely overlooked, they are really re-

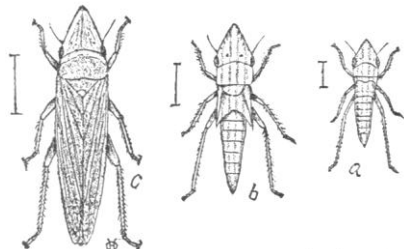


FIG. 1.

Diedrocephala mollipes (Original).

sponsible for much of the damage accredited to other insects or to drought. Studies carried on during the last few years, and which have been reported in bulletins of the United States Department of Agriculture^{1,2} and of the Iowa Experiment Station,^{3,4} lead to the opinion that from one-fourth to one-half of the crop is lost regularly as a result of their work, and that a large part of this loss could be saved by the adoption of remedial measures. It seems also, at least for bluegrass in Iowa, that the common affection known as "silver-top" is to be charged against these same insidious enemies.⁵

While there are many different species concerned in this work, many of which have still to be studied, and representing the families *Jassidæ*, *Cercopidæ*, and *Fulgoridæ*,

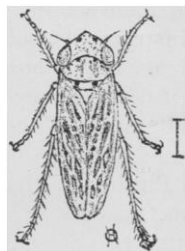


FIG. 2.

Deltocephalus inimicus (Original).

the most numerous, and I think the most destructive, fall in the family *Jassidæ*, and a few of the more common ones may be enumerated here.

Diedrocephala mollipes is a grass-green species about one-third of an inch in length, and its general form, as well as the larva and pupa are shown in the accompanying figure. It occurs abundantly all over the country, but may be noticed more abundantly some seasons than others, and it shows a preference for ground that is moist rather than for very dry localities.

A quite similar species, *Diedrocephala noveboracensis*, is

¹ Bulletin No. 22, Division of Entomology, United States Department of Agriculture, pp. 20-41.

² Bulletin No. 23, Division of Entomology, United States Department of Agriculture, pp. 58-59.

³ Bulletin No. 13, Iowa Experiment Station, pp. 96-101.

⁴ Bulletin No. 15, Iowa Experiment Station, pp. 253-261.

⁵ Proceedings of the Society for Promotion of Agricultural Science (1890).

also quite abundant and widely distributed, but seems to occur more especially around the borders of thickets and in grassy woodland.

Perhaps the most abundant and widely distributed species of all is the *Deltocephalus inimicus* of Say. Its work ranges all through the season, and it may even be found on warm days in winter.

The insect is nearly a fourth of an inch in length and of a grayish color, the most distinctive marks being the black dots on head, front portion of thorax, and on the scutellum; two on each, as shown in the accompanying figure.

Another species which occurs, at times in immense numbers, is the *Deltocephalus debilis* of Uhler. This is smaller than the preceding species, but without a careful examination may be very easily confused with it. It is quite uniform in color, and without the black dots characteristic of that form. Its distribution is probably very wide, though it has



FIG. 3.

Deltocephalus debilis Uhl.
(Original.)

not as yet been reported from as many localities as the preceding species.

Aside from these especially abundant species there are many others belonging to the genus *Deltocephalus*, which seem to be confined to grasses as their food plant. *D. sayi*, *D. harrisii*, *D. melsheimerii*, and others having been taken in greater or less abundance in sweepings from grass.

Cicadula exilis Uhler was first described as a wheat pest, but it has proven a general grass feeder, and must be enumerated among the species affecting this crop. It is about two-tenths of an inch in length, of a brownish color, and the wings are quite distinctly marked with dark veins.



FIG. 4.

Cicadula exilis Uhl.
(Original.)

The figure shows its form and the arrangement of the markings of the body.

Agallia sanguinolenta Prov. is an interesting little species, often secured in grass and conspicuous in very early spring, as the adults can be seen in great numbers under the grass or, on warm days, hopping about on the leaves. It has proved, however, to favor clover as its food plant, and probably feeds on grass only during fall, winter, and early spring. It is about one-eighth of an inch in length, quite broad, about half as wide as long, and marked with numer-

ous dark blotches and short stripes, especially on the wings. This species appears to be double-brooded in the latitude of Iowa, though it is possible that three broods may occur.

The habit these insects have of hopping into the air on the least disturbance renders them open to direct attack with the "hopper-dozer" principle, which has been used so extensively in the contests with the Rocky Mountain Locust.

We have found, however, that a very simple plan of using this principle is the most effective in securing the leaf-hoppers. It consists in coating the upper surface of a sheet of sheet-iron with coal tar, attaching cords at either end, and also in the centre if it is very long, with which to draw it,

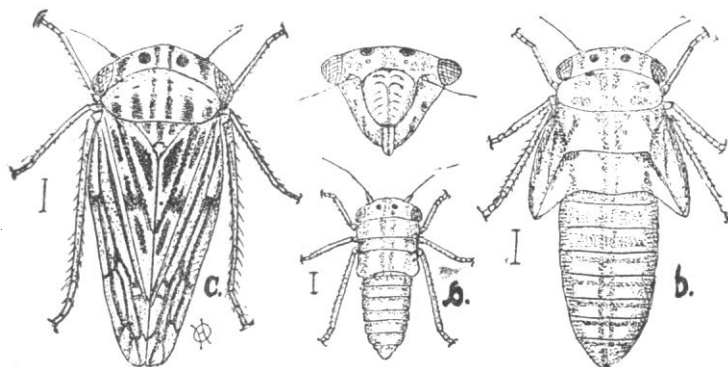


FIG. 5.

Agallia sanguinolenta: A. larva; B. pupa; C. imago, and front view of head of imago. (Original). Size lines are a little too long.

and then it is drawn over the lawn or pasture at a moderate walk by a boy or man at each end.

As soon as the sheet becomes covered with hoppers so that all are not held when they strike the pan a new coat of tar is applied. On an extensive scale this can be used at a cost of but a few cents per acre, and is applicable to large pastures and meadows. Upon lawns and pastures the treatment may be applied at any time when the hoppers appear numerous, but in meadows it is not applicable while the grass is in bloom on account of the accumulation of pollen on the sheet. In general, the best time to apply it is in early May and again, if hoppers are present, in summer, directly after the hay-crop has been secured. HERBERT OSBORN.

Ames, Iowa.

ASTRONOMICAL NOTES.

THE following is an ephemeris for the comet discovered by Denning on March 18. The epoch is for Berlin Midnight:—

	R.A.			Dec.	
	h.	m.	s.	°	'
April 25	2	18	44	+ 58	5.8
26		23	16	57	53.7
27		27	43	57	41.4
28		32	5	57	28.8
29		36	23	57	15.9
30		40	36	57	2.8
May 1		44	45	56	49.5
2		48	49	56	36.0
3		52	49	56	22.2
4	2	56	45	56	8.3
5	3	0	37	55	54.2
6	3	4	24	55	54.2
7	3	8	8	+ 55	25.6

This comet is now increasing its distance from the earth, but in the autumn the comet will again approach the earth, and observations will be possible far into next December.

The following is an ephemeris for the comet discovered on March 6 by Dr. Swift of Rochester, N.Y. The epoch is for Berlin midnight:—

	R.A.			Dec.	
	h.	m.	s.	°	'
April 25	22	14	21	+ 16	10.0
26		17	30	16	57.9
27		20	37	17	45.0
28		23	42	18	31.2
29		26	46	19	16.6
30		29	48	20	1.2
May 1	22	32	49	20	44.9
2		35	48	21	27.8
3		38	46	22	9.8
4		41	42	22	51.0
5		44	36	23	31.4
6		41	29	24	11.1
7	22	50	20	+ 24	50.0

These ephemerides are taken from No. 3,082 of the *Astronomische Nachrichten*. That for comet Swift was computed by Dr. Lamp, and that for comet Denning by Dr. Schorr.

The new star in Aurigæ has now become so faint that it can be observed only in the larger telescopes. It is fainter than the 13th magnitude. G. A. H.

NOTES AND NEWS.

MR. G. C. GREEN records in *Nature Notes* for April a curious reminiscence with regard to a pair of jackdaws kept by him at Modbury Vicarage, South Devon, about twenty years ago. They had been taken from the nest, and during the first summer their wings were slightly clipped. After this their wings were allowed to grow, and they lived at full liberty in the garden. They were perfectly tame, and would come at call and feed out of the hand, would come into the house, and in the morning knock at the windows to ask for some breakfast. In the spring they used to fly away and join their wild companions, make their nests, and rear a family; but when this was over they came back to the garden again, fed from the hand, and were as tame as ever. But the curious thing was, that after one or two seasons they brought another jackdaw with them, presumably the young of one of them, which was just as tame as themselves, although nothing had ever been done to tame it, so that it was impossible to tell which were the original favorites, and which was the new one. Moreover, when after a few years one of these jackdaws was accidentally killed, another was brought by the other two.

— A Seaside Laboratory of Natural History, in connection with the Leland Stanford, Jun., University, will be opened during the coming summer at Pacific Grove, Cal., on the Bay of Monterey, about half-way between Monterey and the Point of Pines. This laboratory will be for the purposes of investigation in the life-history of the marine animals and plants of this coast. It will be under the direction of Professors Gilbert, Jenkins, and Campbell of the chairs of zoology, physiology, and botany respectively. It will be open to naturalists and others wishing to make special investigations in the anatomy or life-history of animals and to teachers of natural science. For further details those interested may apply to any of the directors at Palo Alto, Cal.

— In a discussion on diphtheria, published in the *British Medical Journal* for Sept. 19, 1891, Dr. Russell cited several instances in which steam had seemed to be an active factor in the propagation of the disease. Hot water and steam from a brewery were introduced into some old cesspools and evidently waked into activity germs which, if undisturbed, would have remained dormant.

— A new edition of S. Dana Horton's "Silver in Europe" will be published immediately by the Macmillans. The author has made some additions of importance to this edition in view of the present attitude of Congress on the question of free silver.

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Attention is called to the "Wants" column. It is invaluable to those who use it in soliciting information or seeking new positions. The name and address of applicants should be given in full, so that answers will go direct to them. The "Exchange" column is likewise open.

For Advertising Rates apply to HENRY F. TAYLOR, 47 Lafayette Place, New York.

CURRENT NOTES ON ANTHROPOLOGY.—IV.

[Edited by D. G. Brinton, M.D., LL.D.]

The Study of Jargons.

ONLY lately have linguists awakened to the extreme value of the study of jargons, and of hybrid and mixed languages. The fact is that in such we have the nascent condition of speech, the parturition of language, caught in the act. The phonetic and grammatic laws we see at work in the formation of a jargon are the same which have given to all existing tongues their form and ideality.

The linguist to whom we owe the most in this new field is Hugo Schuchardt of Gratz. His works, published by the Imperial Society of Vienna, have presented especially the mixed dialects arising from the intermingling of Spanish and Portuguese with the native tongues of Insulindia. His analyses of them are masterful, and may justly serve as models for all similar researches.

More interesting to American readers is the recent publication of Dr. Karl Lentzner of Berlin, "*Wörterbuch der englischen Volkssprache Australiens*." It is in English in spite of this German title, and presents glossaries of Australian, Anglo-Indian, Pidgin English, West Indian and South African words. He adds an appendix, with numerous examples, and a discussion of these curious forms.

The book offers racy material for a magazine article, is full of quaint and humorous expressions, and tempts to numerous extracts. But it is enough to name it here, that it may not be overlooked by those who are interested in "Americanisms," folk-lore, slang, and such developments of language.

The Lotos-Eaters and the Troglodytes.

There is something peculiarly attractive in following the ancient Homeric voyages by the light of modern science. Who were the "mild-eyed, melancholy Lotus-Eaters," who

dreamily strolled their island shores? Who the Troglodytes, cave-dwellers, speaking a strange language, which Herodotus compares to the squeaking of rats?

Two recent articles enable us to answer these questions satisfactorily. The one is by Dr. E. T. Hamy, in *L'Anthropologie*; the other by Rudolf Fitzner in the *Globus* (Band lxi.). The Lotos Isle was undoubtedly the island of Djerba, at the southern entrance to the Gulf of Gabes (north latitude 33° 40'). Its population is of unusually pure blood, and presents a fine example of the native blonde type of Northern Africa. The complexion is a full white, or slightly reddish, the head short, the face round, the nose straight, the lips thin. In other words, they are entirely similar to the Kabyles of the Djurdjura, and the Rifians of Morocco. All three belong to the true Berbers, and speak near dialects of the same tongue.

The Troglodytes are of the same blood. They also are Berbers, of the stem of the Matmâta, living in the mountainous region between the Gulf of Gabes and the great salt lagoon, the Schott El Djerid. There they construct their strange, boat-shaped, cave-dwellings, just as they did in the days of Sallust and Herodotus and long before.

It is interesting to note that Fitzner (who adds a good ethnographic map of the regency of Tunis) recognizes the probable ethnic identity of the Berbers, Iberians and Etruscans,—a relationship which I believe I was the first to maintain.

A Native Maya Historian.

One of the most interesting documents relating to the history of America in the sixteenth century is a narrative of the Spanish conquest of Yucatan, written in his native language by a chieftain of one of the subjugated Maya tribes. The original text was published complete for the first time in Vol. I. of the "Library of Aboriginal American Literature" (Philadelphia, 1881), with an English translation. It merited, however, a much more complete analysis than was there given it, and this it has lately received from the competent hand of the eminent linguist, the Count H. de Charencey. Under the title, "*Chrestomathie Maya d'après la Chronique de Chac-Xulub-Chen*," he gives us an octavo volume of 301 pages containing the original Maya text with an interlinear translation in Latin, an exhaustive grammatical analysis, and a complete Maya-French vocabulary.

M. de Charencey very justly remarks that there is scarcely any other American language which presents so much interest as the Maya, in view of the high civilization of the people who spoke it, as well as its own linguistic traits. His excellent "*Chrestomathie*," therefore, should be obtained by all our leading libraries. It is published in Paris, Librairie C. Klincksieck, 11 Rue de Lille.

Dr. Topinard's Latest Work.

All who know anything about the literature of anthropology are acquainted with the works of Dr. Paul Topinard, and will acknowledge that there are none better on physical anthropology. The latest from his pen is "*L'Homme dans la Nature*" (Paris, 1891), a title which cannot be considered a very fortunate one, as it is difficult to imagine where else man could be than in nature. But let that pass. The interest of the volume lies in the more pronounced position which the author takes on the theory of human evolution, or, as the French prefer to call it, transformation. This theory is undoubtedly less popular in France than it was

ten years ago, a change mainly owing to direct and indirect clerical influence; and it is therefore gratifying to find an eminent teacher like Topinard, boldly pronouncing in its favor, and declaring that it is the only possible theory adequate to explain known facts in the physical history of the human species.

The author makes frequent reference to his larger work "*Eléments d'Anthropologie Générale*"; but the instructions for practical observations and the abstracts of the results of other investigators furnished in the present much smaller volume, will be sufficient to satisfy those students of the subject who feel themselves somewhat appalled by the nearly twelve hundred closely printed pages of the "*Eléments*."

Some Native Brazilian Tribes.

A model ethnographic study is that of some Brazilian tribes by Dr. Paul Ehrenreich, published in the second volume of the *Veröffentlichung aus dem Königlichen Museum für Völkerkunde zu Berlin*. He takes up the Karaya stock on the river Araguaya, and some tribes, the Paumari, the Yamamadi and the Ipurina on the Purus River. His descriptions meet all our requirements except in the important matter of language. This he no doubt designedly omits; though he mentions that among the Karaya the men and women have separate dialects, rarely, however, radically different words.

Of these little-known peoples he describes the costume, house-building, methods of obtaining food, tools, and weapons, etc. It is curious to note the love of the Karayas for taming animals. "Their villages resemble menageries." Dogs, fowls, cats, peccaries, parrots, even turtles, alligators and tapirs, meet the astonished traveller. The native does not look upon them as "lower animals," but quite on the same plane of existence as himself, and as his friends and companions.

The history and extension of the tribes are defined, and a number of admirable photogravures set forth truthfully to the eye their physical characteristics.

A MACHINE FOR CHURNING FRESH MILK.

In Bulletin No. IX. of the Delaware experiment station (Newark, Del.) are given the results of a series of experiments made to determine the practical value of the butter extractor, a machine with which butter may be made directly from the freshly drawn milk.

In principle this machine resembles the DeLaval separator, which has now come into general use in creameries and large dairies, by which the cream is separated from sweet milk by centrifugal motion, but the butter extractor goes a step farther, and not only separates but churns the cream.

The machine operated with was made by an American company. It was found to require considerable experience to operate it successfully, and the tests upon which the station's comparisons are based were made under the personal supervision of the manufacturers of the machine. The results were that it was found that while the separator and churn obtained 93.34 pounds of butter out of every 100 pounds in the milk, the extractor obtained but 84.60 pounds, a loss of 8.74 pounds, and the butter thus obtained was of such quality that it could not be sold in competition with butter made from ripened cream.

In summing up the results of his tests Professor Penny, the chemist of the station says:—

"As to the relative expense of running in the one case the extractor alone and in the other the separator and churn together, it is doubtful if a creamery having only one machine would save anything in the number of hands employed, while in larger establishments the loss, greater by 8.74 per cent, caused by the extractor is heavier than the saving in wages. On a daily business of five thousand pounds of milk this deficiency is equal to fifteen or seventeen pounds of butter, yet such a business with the separator and churn need not employ more than two men, and the extractor could hardly employ fewer. The expense for power, etc., is nearly the same in the two cases. It must also be considered that while the separator requires the milk to be previously heated during much of the year—a simple and cheap operation—the extractor requires it to be cooled, at least in warm weather, and this calls for a greater supply of cool water or of ice—a decided disadvantage and in some creameries an unwarranted expense.

"Hence one feels justified in concluding that, if the quality of the butter be left out of the account, the extractor at present offers no substantial advantage that is not outweighed by defects, and that it would not allow any saving in expense over the process it is designed to supplant.

"Run as a separator alone under good conditions, this machine ought to give most excellent results, though in common with the DeLaval, and doubtless others, it varies greatly in skimming power, from causes that are partly unknown. As a skimmer it may be considered strictly first-class.

"Although the extractor appears unfavorably in comparison with a much older method, it cannot but be regarded as a marvel of inventive and mechanical skill. The surprise is in the first instance that it should do its work at all, and then, even though it be found wanting, that it should do its work so well. It is brought at the start into competition with a highly perfected machine and a method thoroughly understood from many years of experience. Its shortcoming under the severe test to which it is obliged to submit ought not to be cause of disappointment; there is room rather for encouragement, because it has done so much. Its future development is probably a question of the relative merits of sweet-cream butter and sour-cream butter.

"If experience and an educated taste shall finally favor the former, the extractor may be expected to take the place of the separator and the churn. But unless the decision shall fall in that direction, it is doubtful if the new device ever comes into general use."

It should be added to the foregoing that the comparison was made with the most perfect method of separating cream from milk now known. Had the extractor been compared with the old method of raising cream, the outcome would have been less unfavorable, as the separator gets out more cream than can be raised by gravity.

THE HIGHER EDUCATION OF THE DEAF.¹

NATIONAL DEAF-MUTE COLLEGE,

WASHINGTON, D.C., April 1, 1892.

A. L. E. CROUTER, A.M., Principal:

My Dear Sir.—Your suggestions have received my most serious consideration. Allow me to thank you for the assurances of your friendly regard for the college and your appreciation of the value of the work it has already done. More grateful to the officers of the college than any written words could be, is the record of your

¹ Reply of President Gallaudet to the letter by Principal Crouter published in *Science* for April 8. Reprinted from the *Silent World*.

past efficient support of its work by the sending of a large company of students to it well prepared to enter and to profit by its advantages.

The proposal that the college should provide oral recitations for students that have been able to engage in such recitations in the schools in which their preparation for college has been completed, appears at first glance to be a very natural and proper one. A full study of the subject, however, discloses objections which to many minds will seem very serious. First of all should be considered the expense of carrying your suggestion into effect, not for a single year only, which would be small, but for the five years of the college course, which is quite another matter. The time and strength of the professors now at the command of the college are fully consumed with the duties at present assigned to them, and were separate oral recitations provided for orally taught members of each class, a complete duplication of the faculty would be demanded, and this not only as to numbers, but also as to ability, qualification, and experience. Such an increase of our teaching corps would involve an additional annual expense of at least ten thousand dollars.

The whole force of your suggestion rests, if I mistake not, on the statement that the pupils of oral schools "hesitate, and object, and refuse, when directed to Kendall Green, not because it is not a good school, nor because its professors are not competent men, but because of a well founded fear that that which they have spent much time and labor in gaining, namely, their speech and their ability to read speech, may be very seriously impaired" by the lack of oral recitations in the college. Now I will lay no stress, as many would, on the admission made in stating this point, that the speech and power to read the lips of others, gained only at great cost by the orally taught deaf, are possessions which may easily be lost; for my experience leads me to have much more faith in the security and permanence of these valuable acquisitions than you and Mr. Greenberger seem to enjoy, and my reasons for this stronger faith will presently appear.

It is not true, as the uninformed reader would infer from your letter, that the orally taught deaf of the country have never enjoyed the advantages of the college. Pupils from the Clarke Institution, from the Boston Day School, from private oral schools, from Mr. Greenberger's school, and last, but not least, a pupil who had for several years the special training of Professor Alexander Graham Bell, have been connected with our college for longer or shorter periods, one of them graduating with honor from our scientific course. None of these students enjoyed the advantages of oral recitations in the college. They had no special teaching in speech or lip-reading. They did, however, have considerable practice in speech while connected with the college.

No complaints came to me from these pupils, nor from any of their friends, while they were with us or after they had left us, that their powers of speech and lip-reading were even temporarily, much less permanently, impaired by their connection with the college. The father of one of Mr. Greenberger's pupils, who was for two years a student here, writes, under date of March 29, 1893: "In reply to your inquiry I desire to say that H. did not speak quite as well on his return, perhaps because that at college he had not as much chance to use his lips as he did while at school in New York, but since he is home, our conversation at home, as well as in our business with him, is so frequent, that I am happy to say he speaks as well and as understandingly as ever."

The father of another of Mr. Greenberger's pupils who pursued our full scientific course, taking the bachelor's degree, says in a letter just received: "I do not think my son's power of speech and ability to read the lips were injured in the least by his taking a course in your institution."

Four others of the orally taught pupils to whom I have just referred have informed me within a few days that, on the testimony of their friends, they experienced no permanent injury to their powers of speech and of lip-reading in consequence of their connection with the college. And the friends of two of these thought their speech improved while they were in college.

Now, in considering the cases of these orally-taught pupils to whom reference has been made, it must be kept in mind that they were all connected with the college at periods when no instruction

in speech and lip-reading was afforded to any student. And yet it appears that not one of these young people, representing as they did the leading oral schools of the country, suffered any permanent injury to their powers of speech and lip-reading while students here. What more convincing proof could be given that the "fears" of the oralists voiced in your letter are not "well-founded?" And if these fears are justly dissipated by the records of times when no articulation teaching was afforded in the college they surely need be accorded little weight at present, when ten instructors are actively engaged in giving daily lessons in speech and lip-reading to the students of the college. There are those whose opinions are entitled to respect, who believe that the plan put in operation the present year by the college for preserving and improving the speech of all its students, including the orally taught, will produce more satisfactory results than the one proposed by you, which would involve, inevitably, an increase of ten thousand dollars in the annual expenses of the college, and this for the sake of a number of students not likely to be more than twenty-five. And should the alternative you press in your letter as, apparently, an ultimatum, be followed, of establishing a college especially for the orally-taught deaf, the increase in the expense of their higher education would be much greater than even the figure I have named. We are trying an experiment, the results of which are thus far encouraging, to continue which will involve no increase of expense, while you urge a scheme certain to be very costly, and by no means sure to give better results. In view of the unprecedented facilities for oral teaching newly offered in the college the present year, and which will be continued next year, will it not be safe to intrust orally-taught pupils to us for a year or two, or at least until it can be demonstrated that our way of preserving and improving their speech is a failure? For if it prove a failure, no one will be readier than I to accept such a result, and to advocate what you believe to be "the more excellent way."

The officers of the college are gratified at the prospect of receiving a greater number of students from the oral schools than have come to Kendall Green in the past, and while they cannot feel justified in acceding to the particular demand of your letter, at least until their own experiment has proved a failure, they are ready to give the most earnest assurance that, with every orally-taught pupil who may seek admission here the coming year, no pains will be spared to preserve undiminished whatever powers of speech and speech-reading such pupils may bring with them.

The force at present available for articulation teaching in the college will make it possible for us to give special individual training to such orally-taught pupils as may seem likely to derive more benefit from instruction so afforded, than when given in a class.

Some editorial comments on your letter, which appear in the *Silent World* of yesterday, leave me to say, in closing, that nothing could be further from the truth than an assertion that the present attitude and existing arrangements of the college as to oral teaching put the stigma of governmental condemnation upon the oral method. The fact that ten instructors are devoted to the work of speech teaching in the college is a sufficient refutation of any such claim. It by no means follows because a certain manner of using a certain method is found helpful to certain deaf children in primary schools, that the identical way of making use of this method is necessary, or will even lead to the best results, with these same persons under the changed conditions of collegiate instruction. And it would be a most distorted inference to conclude that because the college gives oral teaching to its students in a manner somewhat different from that employed in the pure oral schools it is thereby placing a stigma on the oral method.

The editor of the *Silent World* is quite right in acquitting "the authorities at Washington" of any such intention, and I trust the statements of this letter will give wings to all his apprehensions on the subject.

Our directors feel that the existing arrangements of the college, under which the essential features of the two leading methods of instruction are combined in a manner calculated, as they believe, to produce the best results, ought to satisfy the friends of both methods.

They have great confidence that results in the near future will

prove the wisdom of these plans. And whether this confidence be misplaced or not, they think they have a right to expect that no unfriendly attitude will be taken towards the college while the important experiments only recently begun are being pressed steadily to a decisive conclusion.

Very sincerely yours,

E. M. GALLAUDET.

THE TEACHING OF SCIENCE.¹

THE subject chosen for this paper, The Teaching of Science, is a broad one; far too broad for more than a very superficial treatment in the time allowed, but it is my purpose rather to call attention to certain general ideas in which too much of our modern science teaching seems to be at fault, and to try to suggest lines in which we may hope for improvement. While I use the term "Science," I have particular reference to the so-called natural sciences, though perhaps the ideas are capable of a wider application.

Among these natural sciences there are certain ones to which my attention has been more closely drawn, but I believe the principles which should be at the basis of instruction in them will apply equally well to all.

Why do we study the sciences? how far do we attain our ends in this study? and is it possible for us to attain them more completely than by our present methods? These are the three questions I desire to consider.

1. Why do we study the sciences? Were we to judge from the great mass of science teaching of the present day, we would be obliged to answer unhesitatingly that the natural sciences are taught chiefly at least, for the purpose of acquiring certain facts which are supposed to be of the necessary stock in trade of a well educated man or woman, or perhaps I should speak more correctly, were I to say, facts which every well educated person ought once to have known sufficiently well to have passed an examination in them; in as much as, for better, for worse, most have forgotten a great share of these acquired facts. I say were we to judge by the way science is taught, though few teachers would admit this mere acquisition of facts to be their aim in teaching. If we should inquire of these teachers, they would undoubtedly tell us of the "disciplinary value," that vague expression often heard and so unsatisfactory to the pupil, as he repeats his *amo, amas, amat*, or pauses to rest on his *pons asinorum*.

In all education we have two aims; the direct furnishing of the mind with a store of facts and the development of the mind so that it can utilize these facts and attain others; we teach, and we teach how to learn. Now there are undoubtedly, a vast multitude of facts in the natural sciences, which are of practical value in every-day life; but after all these are of little importance compared with the tremendous development of the mind which may be and ought to be gained by this class of studies.

The natural sciences are pre-eminently the studies to develop the reasoning powers; every step has been and can be logically worked out from the preceding; nowhere else do we find that gathering of facts, perhaps very few in number, under an hypothesis, and then, by gaining new facts by study and experimentation, the development of the hypothesis into a theory and, it may be, a law. The best instruction in logic I ever had was in a class of a dozen or so, where we had each made quite a series of apparently unconnected experiments in physics, then were given the task of arranging our descriptions of these experiments in their proper sequence, discussing in the class room our arrangements and defending each his own choice.

The chief aim in the study of science should be this development of the reasoning power; the teaching of independent thought; and the acquisition of facts in themselves, however important some of them may be, should invariably be made subordinate to this. I ought in this connection to refer to what is often spoken of as a very important aim of science teaching, that of training the power of observation. Of course when rightly studied, science does train this power, and even the most superficial elementary course in any science cannot fail to make the scholar

now and then a little more interested in observing what goes on around him than he otherwise would be; nevertheless the training of this power is of value only just as far as it is a means of training the reasoning power. A man may have a marvellous gift of seeing everything and seeing it accurately; but this gift is of value to him only as far as he can utilize it as a basis of thought; and therefore I would hold that the training of the power of observation is embraced under the all important aim of science teaching, the development of the mind, the development of the power of thought.

This should be the chief aim of all instruction in natural science; all else is of little use.

2. Now how far does the instruction given in our institutions of learning, our schools, academies, colleges, and universities, tend to carry out this idea?

Until quite a recent time there has been little or no instruction in natural science given in our lower schools; in our cities at the present time there is more or less of an attempt being made to introduce the study of chemistry and physics. I leave out of account for the present the kindergarten, where there seems to have sprung up a germ of the true idea of science teaching. The most that is expected in our common schools is that the teacher shall hold a few recitations from a text-book, from which the scholar is supposed to familiarize himself with a large or small number of facts and possibly to learn the statement of a few laws or theories. In the higher schools, the academies, and some of the colleges, a somewhat greater task is attempted; here the text-book is supposed to cover practically the whole science and a correspondingly great number of facts is sought to be memorized; with a couple of recitations a week, the student is expected to go through "fourteen weeks in chemistry," or physics, or geology, and to have learned the gist of the whole science. Here we have a mere feat of memory, of just as much value, perhaps, as the committing to memory of so many lines of "Paradise Lost," certainly no more. In many, perhaps most, cases the teacher is as ignorant of the subject as the scholar, and must have the text-book continually open in order to recognize if the answers are correct. One college in Kentucky advertises to give complete, thorough, and practical courses in each of the sciences in a term of ten weeks; think of acquiring chemistry, physics, geology and astronomy in less than a year, and not neglecting other studies in the meantime! Of late, however, it is coming to be very generally recognized that scientific instruction cannot be imparted without experiment, and so the teacher performs before the class some of the simpler experiments. This is indeed a step in the right direction, but in most cases only a very short step. An experiment merely as something for a class to look at or be entertained by is valueless; indeed the only value of an experiment is in making clearer the principle it is intended to illustrate. If it fails to do this, it fails to accomplish any thing. I remember asking a young lady, who had a few months previously passed a fine examination in chemistry in one of our higher institutions, if she remembered how oxygen was made, "Oh yes," she said, "why! the professor took something black and something white, and that was oxygen." Some features at least of the experiment had made an impression. In most of the colleges and academies for ladies, I think it is no exaggeration to say that science study as usually conducted is of no value; the only science which there is an attempt to study at all thoroughly is botany; and even here it is questionable to my mind if the student get from this any thing which justifies the time put upon it, except that incidentally the fresh air exercise obtained in gathering specimens provides that which is much needed by all young ladies. The end usually sought is ability to analyse, by the aid of tables, the common plants, rather than the study of these plants. In no other science is the absurdity of this method of study so apparent. In the chemical laboratory it is true that the use of analytical tables is a prominent feature, but there seems to be at least a practical end attained. Imagine a study of zoology or of mineralogy which should find its end, not in studying the animal or the mineral, but in merely finding out by a set of artificial tables what it is, and we see the fallacy in calling it science. I believe it would be better for all students of botany, and I think

¹ Read before the Kentucky College Association at its latest meeting.

I may add, of chemistry as well, were all analytical tables destroyed.

This brings us to the subject of laboratory work, the *sine qua non* of scientific study. This is at the present day, so far acknowledged that in none of our colleges, and few of our better high schools and academies, would the instructors think for an instant of trying to teach certain sciences without the laboratory. We may thank the chemist for the introduction of the laboratory idea. But to-day there are few colleges, except the larger, and still fewer of our academies, where we find physical or biological laboratories; yet, even with the laboratory, we have by no means reached the ideal in scientific instruction, save in a few institutions. Take, for example, much of the laboratory instruction in chemistry. With a book of directions before him, the student performs certain experiments; with a set of tables, he goes through the process of perhaps separating the metals, and may become even a good analyst, without having profited to any considerable extent by his work, all being performed mechanically. In the physical and biological laboratories there is far less danger of this misapplication of scientific study, and this largely from the fact that laboratory work in these sciences is a more recent idea and less systematized. In our modern education there is a most pernicious tendency, well exemplified in botany and chemistry, as we have seen, but found in other studies than the sciences, toward machine instruction. Everything is most systematically arranged, and students, bright and dull, are all dosed with so much per diem. The text-book is made everything, and the teacher nothing; and, as a result, we are losing our teachers. Their function seems to be no longer to teach, but merely to see that the required dose is taken. The scholar loses his individuality, and merely becomes like the Strassburg goose, cooped up and so much food forced down its throat so many times a day, the only demand being that on examination day its liver shall have attained the regulation size. In our larger colleges, where each instructor is confined to but one branch, and is, as a rule, an expert in teaching that branch, things are more as they should be; the true aim of science study is more nearly attained. But here these instructors are met with the difficulty that the student has so long been the victim of bad methods that it is almost impossible to successfully introduce the good ones. Then we must further even bear in mind that the great mass of the youth of our land do not have the advantage of college. It is but a small percentage who even enter the high school. Has science nothing to do for those whose school-years are few in number and who are to make the great bulk of our citizens? I believe she has, and will try to point out, or at least to hint at, what seem to me to be the methods by which science-teaching can be made to accomplish its true mission.

3. That which we must seek to do may be expressed very simply. We must seek to so teach science that the student, be he man or woman, boy or girl, or even a little child, shall be led to think about phenomena. If the great good to be attained by science study is the development of the power of thought, we must do all in our power to induce thought. The kindergarten, child's play, as too many consider it, may teach us an important lesson. It is play indeed, but the child is led to think about his play, and the effect of kindergarten instruction may be clearly seen in those who have had the advantage of its training. It is surprising how few even of our college students are capable of independent thought. We see the lack of this thought in the sets of answers to examination questions now and then published, generally with the idea there is something humorous about them. They may for the moment excite our laughter, but rather are they a cause for pain, as bitter examples of the deficiency of our system of education. I would have science-teaching begin with the first of a child's education, or rather it should begin at home, long before the child is thought old enough to study the alphabet. If the child is taught to notice anything in nature, be it a stone or an insect or a little rill of water, he will need but little encouragement to ask questions about it, and, by a judicious directing, he can be led to do his own answering. I have seen a little girl, hardly six years old and unable to read, reason out for herself the general principles at the basis of evolution by merely calling her

attention to a few little clumps of blue and white and yellow violets, growing in close proximity. In the lowest grades of our schools the teacher should encourage children to collect all kinds of natural objects, and those found in any locality will be amply sufficient for science study. One of the "plays" in the kindergarten is for the children to plant different kinds of seeds and watch their growth. Similarities and dissimilarities attract attention. We all know the innate desire in every child to dig up the recently-planted seed and see how it grows. The kindergarten wisely utilizes this.

In the few years of common school, the child will have perhaps not the least systematic scientific knowledge, but he will have learned to think about all that goes on around him, and then when, at a later period, he takes up the sciences systematically, he will find that he is already possessed of a great number of facts which will almost arrange themselves, and that not merely in an orderly manner but, what is far more important, intelligently. In our common schools I would have science instruction given from the lowest to the highest grade, and this wholly without the aid of text-books. A short time should be taken every day, with each class, for this purpose, the teacher endeavoring to interest the class and draw them out on some natural object or phenomenon.

It matters little what the particular science chosen may be; if there be one in which the teacher is especially interested, that is the one to use; a handful of marbles, a base ball, or a bat, will serve to interest the boys and instruct them on many a point in mechanics; a few rubber bands stretched across a cigar-box, in sound; a mirror, a burning-glass, and a prism, in light; zoology affords, throughout its whole field, countless specimens for entertaining instruction to the young; they may in familiar examples, and in specimens of their own collection, study the different developments and uses of homologous organs, as the arm of man, leg of mammal, wing of bird, and fin of fish; or the different modifications of the same organ, as the comparison of the eyes of vertebrates with those of insects and molluscs; or the different organs used for the same purpose, as the organs of prehension in man, monkey, elephant, parrot, snake, lobster, and insect; or, on the other hand, they may find it more interesting to study from a systematic standpoint, finding out for themselves the differences between animals of different classes, as between herbivores and carnivores, insect-eaters and rodents, insects and spiders, one-shelled and two-shelled molluscs. It may in some localities be possible to compare some of these modern forms, as snails, with very similar fossil specimens near at hand; and here we can call geology and paleontology to our aid in work with children. And again, just to allude to one more science available for this work, the kitchen closet, with the occasional aid of a few cents' worth of some acid or the like at the drug store, will afford us most ample opportunity of impressing the most important lessons of chemistry; combustion, respiration and decay, pure air and ventilation, dryness as a disinfectant, fusion, solution and crystallization, and a thousand similars, many of them of great practical value in their applications, but far more useful as agencies for thought development, come to our mind as possibilities in chemistry as a science for the young. I might take up each science in its turn, for each can easily be made to serve its purpose, but these examples will illustrate what can be done in any one of them; not one thing mentioned but is within the reach of any faithful common school teacher; but how long will it be before we see any general materialization of such ideas?

Thus far I have referred to scientific instruction in the lower schools, which do not so directly concern the members of this association; the same principle, however, is applicable to the higher schools, and we must not forget that the lower schools, which lie at the basis of our civilization, are just what our higher institutions make their teachers. When the high school and academy are reached the possibilities in scientific instruction broaden vastly. In the case of those who have had such elementary training as described, the task is easy; but the problem is harder with others, owing to the difficulty in teaching correct methods of study to those who have for a period of years been drilled in bad ones. Eight or ten years of learning by rote are enough to unfit a child

for anything else. Two points we must have before us if the scientific work is to be done for the purpose of attaining its chief end: we must as far as possible lose sight of study for either practical ends, or for the purpose of general information; and we must as far as possible adopt laboratory instruction. In regard to the first point, we suffer more in our academies and high schools, but perhaps also in our smaller colleges to a lesser extent, from rushing through these abbreviated courses in the sciences, than anywhere else; here it is chiefly that we find the task set of giving every student an outline view of every science, embracing as many diverse facts as his memory can hold. Particularly are the fairer sex compelled to suffer in this regard. Better far to take a single science and develop it much in the same way, though more systematically and to a more extended degree, as that already suggested for use in lower schools.

As regards the laboratory work, it may be very simple and inexpensive, but it is an invaluable aid in science teaching; a table, a dissecting case, a lens, a few glass jars, a few chemicals, and if possible a small microscope, slides and cover glasses, will form a sufficient equipment for a very practical biological laboratory; even some of these are not absolutely necessary, as the dissecting case may be replaced by a good knife. For botany the lens, or better the microscope, is almost alone needed; for mechanics, a few of the most familiar carpenters' tools and a bench for work, comprise the necessities, while in the other branches of physics but little is needed. Even in electricity, a few pieces of copper and zinc, some old electric light carbons, a few chemicals, some wire and a magnet, will go a long way in instruction. Chemistry is supposed to require the largest outfit, and yet I think that some of our dealers in such goods could make no little profit by fitting up collections of chemicals and apparatus for the purposes we are considering, at the cost of not over a dollar for a full set for each student, and five times that amount for the teacher's set; in other words, expensive equipment is wholly unnecessary for elementary laboratory instruction in any of the sciences, indeed in too many cases, an extensive set of apparatus and fittings distracts the attention of the student from the experiment he is studying. Now in using the laboratory, let it be clearly understood that there is no "practical" aim sought, but merely that the student shall think out for himself all the facts connected with the experiment; if it be considered that a knowledge of certain facts is necessary to his education, let him be shown where in the dictionary or encyclopedia these facts may be found.

Our brains are limited in their capacity, and if we load them with that which is of little or no use, there will be little space left for that which is of more importance. Let the student know just where to go for these facts, rather than have his mind filled with them in preparation for examination day. Our aims in science study will be best attained by a few simple experiments, carefully studied and reasoned upon, and these every higher institution ought to furnish.

When we come to science instruction in college, the same train of reasoning applies, but here it is far easier to carry out our principles. It obtains in college, as in the lower institutions, that the student is expected to gain at least a smattering of the chief sciences; still, with our optional studies, the chance for obtaining the true aim of science study is far greater. One reason for this is the increased time allowed to each subject, and the fact that the teacher is more or less of a specialist in the branch or branches he teaches. Let us in this connection look a little more closely at the science with which I, as a teacher, am more familiar than any other, that of chemistry; for this will serve us as a type of them all. Chemistry is studied at college by two classes, one that desires to gain a thorough knowledge of the subject, usually for some practical end, and the other, generally comprising all the students who pass through college, desiring merely to gain a general view of the whole field. Since a thorough study of the chemistry of the non-metals is necessary as a foundation for further prosecution of the science, and since the time required to lay such a foundation is fully as much as the majority of the students can spend on the whole subject, it has been in many places in time past, and indeed perhaps we may say is to-day, the general plan to let the two divisions work in entirely different plans, the

one class going superficially over the whole subject of chemistry in a term, while the other proceeds slowly and thoroughly. This is, I believe, a great mistake; the rapidly moving class is at just the same disadvantage as the academy and high school classes we have already noticed; they are trying to learn facts and statements, and thereby lose the true aim of science study. It would be far better for them by slow study to thoroughly master the principles of the science, and gain its value in stimulating thought, and in a few days' reading at a later period they could gain a far better knowledge of the whole subject than otherwise in the whole term. The student should, in the laboratory, perform after the professor each of the simpler experiments, and be questioned particularly and chiefly as to the meaning and signification of the experiment. In the quantitative laboratory he should study the metals comparatively, paying particular attention to similar reactions by which metals may be classed together, and to dissimilar reactions by which the metals may be distinguished and separated. In this way he may cut himself loose from all artificial tables except as far as he shall form these tables for himself as a result of his work (I may here perhaps be allowed, by way of parenthesis, to add that I believe it will be found more advantageous for the student, when beginning work on the metals, to examine first the effect of each of the common reagents upon all the metals, than the commonly adopted method of testing each metal with all the different reagents; in this latter case the student for the time being loses sight of comparative reactions).

The more thorough a student is in his work, the more he applies to it all his power of thought; the better his mind will be fitted to carry the science into practical work, should such be his ulterior aim. The more he works by rule, the less fitted will he be for more advanced work, and the less able to leave the beaten track.

The general principles here laid down in the study of chemistry, will be applicable to the other sciences. It will be better far for the student to cover less ground and to lay a thorough and thoughtful foundation; the further general knowledge of the subject will be easily and quickly gained whenever it may be desired. So too as regards the idea that a student should study at least a little of every science. To my mind it is better far to devote one's self thoroughly to one science or perhaps two in college; so similar are the methods of thought in them all, that he who has mastered one, can take up by himself any of the others sufficiently well to gain as much knowledge of it as a *liberal education* demands, while he who devotes himself in college equally to all will not only know little of any one, but he will almost, if not completely, have failed to gain the development of mind which science study should give him, and the superficial knowledge and facts gained will, for the most part, pass from his mind, as soon as examination day is over. With the scientific method of thought once gained, however, the facts in all other sciences, will naturally fall into such logical sequence that they will, for the most part, readily remain in the memory.

In summing up this paper let me repeat in conclusion that in my opinion, science study, to have its true value, must have ever before it from Common School to College, as its chief aim, the development of the power of thought; without this aim, it is time largely thrown away; with it, it is one of the most potent agencies in modern civilization.

JAS. LEWIS HOWE.

Polytechnical Society, Louisville, Ky.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

The Question of the Celts.

I REPLY with much pleasure to Professor Haynes's inquiries in *Science*, April 8, p. 207.

The theory of the European origin of the white race was advanced by Omalius D'Hallo (who is almost as well known for his labors in ethnology as in geology) in various papers published

previous to 1850 in the *Bulletins de l'Academie Royale de Belgique*. These must have been known to Dr. Latham, though he nowhere acknowledges indebtedness to them.

The work of Broca, in which he states that the Celts were a mixed type, is his "Nouvelles Recherches sur l'Anthropologie de la France." His words are, "C'est dans cette race mixte que se constitua plus de quinze siècles avant J. C. la nationalité des Celts."

In designating the ancient, blond, dolichocephalic people as Kymric, I follow the best French authorities, such as Dr. Collignon. The ancient Britons, Queen Boadicea and her subjects, were of this type. I cannot understand how Professor Haynes can say "all Celtic people now have black hair," in view of the type of the Scotch Highlanders and the Irish east of the Shannon. In reference to the invaders of Rome, I simply claimed that they spoke a Celtic dialect; I now go further and aver that, in the case of free tribes, speaking a dialect does prove blood relationship in all cases I know of.

D. G. BRINTON.

Philadelphia, April 19.

The Question of the Artificial Production of Variations in Type.

ATTEMPTS have been made to modify the forms of animals, or produce new species, by deforming the parent, e.g., in the case of the attempt to produce a breed of short-tailed mice by mutilating the tails of the parents. Is this not beginning at the wrong end? Are not all transmitted variations transmitted by parents which were modified before birth? All successful attempts to produce and transmit modifications in the breed being the result of breeding from animals that have been congenitally modified, would it not seem the proper and only method to study the laws governing the modifications of the embryo and having discovered these, the production of modifications in species would be a matter of slight difficulty. Congenital variations are the result of law and not of chance.

GERALD M. WEST.

Clark University, Worcester, Mass., April 17.

AMONG THE PUBLISHERS.

MESSRS. MACMILLAN & Co. have issued a second edition of Mr. A. R. Wallace's well-known "Island Life, or the Phenomena and Causes of Insular Faunas and Floras." The work has been carefully revised throughout, and, owing to the great increase in our knowledge of natural history of some of the islands during the last twelve years, considerable additions and alterations have been required.

— We have received a copy of the "Graphic Atlas and Gazetteer of the World," edited by J. G. Bartholomew, F.R.G.S., F.R.S.E., and published by Thomas Nelson & Sons. It is an entirely new atlas, with over 220 maps, charts, plans of cities, etc., all revised to the present date. A most valuable feature is the Gazetteer of the World, with nearly 55,000 places, specially complete in American names, and results of new census. In the United States section a separate map is given of each of the States and Territories, specially compiled from the latest Government Survey Maps. In proportion to its contents this volume is quite unique among atlases for compactness and portability. It is of quarto size, bound in half-morocco, gilt top, and sold at the very moderate price of \$7.50.

— Both admirers and critics of Spencer will be interested in the paper on "Herbert Spencer and the Synthetic Philosophy," in the May *Popular Science Monthly*. The writer, Mr. William H. Hudson, was formerly private secretary of Mr. Spencer, and gives an insight into the process by which his philosophic thought unfolded. The paper contains also a statement of the relation between the work of Darwin and that of Spencer. Professor Frederick Starr will contribute some "Notes upon Anthropological Work in Europe," telling what museums and other facilities for the study of anthropology exist abroad. The article is illustrated with twelve portraits of leading European anthropologists. "Cave-Dwellings of Men" is the subject of a copiously illustrated article by Mr. W. H. Larrabee. It relates not only to the ancient cave-dwellings of America and the Old World, but describes also the

way in which modern troglodytes are living in several parts of Europe to-day. In an article on "Evolution in Folk-Lore," Mr. David Dwight Wells gives two versions of a negro legend nearly a century apart in time, which show the alterations produced in the tale by the change from free life in Africa to slave life in America. An Index to Volumes I. to XL. of *The Popular Science Monthly* is well advanced in preparation, and will be published in the course of the coming summer. The entire contents of the forty volumes will be entered both by author and by subject in one alphabetical list, and the Index will have all the most approved features of the latest magazine indexes, besides some novel ones. The compiler is Mr. Frederik A. Fernald of the editorial staff of the *Monthly*.

— *Nature* notices the appearance of a very useful work, in Russian, by Professor Samokvasoff, on Russian prehistoric antiquities, under the title of "Foundations of a Chronological Classification of Antiquities, and Catalogue." As seen from the title, the work consists of two parts: a catalogue of the very rich collection of the Russian professor, partly illustrated, and a general description of the various epochs which may be distinguished in the relics of the past on the territory of Russia. He has no difficulty in showing that the Slavonians of the first centuries of our era were by no means mere savages. The burial places of that period, usually situated close to the earthen forts, some of which must have required the work of a considerable population, contain hundreds and thousands of graves, so that it is certain that the Slavonians of that period were living in large societies, and had their fortified towns. The same burial customs prevailed over large areas, but the treasures now unearthed from various graves show that differences of wealth and social position existed at that time as well. Considerable amounts of Greek, Roman, and Arabian gold and silver coins were found in the graves, the metal alone of the coins found in some graves attaining, at its present prices, the value of several hundred pounds; while numbers of objects of art, of Greek, Roman, Byzantine, and Arabian origin, are proofs of the brisk foreign trade which took place at that time. The graves of the pagan Slavonians contain flax, woollen, silk, and gold-embroidered tissues; ornaments in gold, silver, bronze, and bone; iron weapons and parts of armament; gold, silver, bronze, iron, and clay vessels, and so on; while the sickles and the grains of wheat, oats, and barley which were found in the graves of South Russia, together with small idols and other objects devoted to pagan worship, are proofs of agriculture having been carried on during the pagan epoch.

INDUSTRIAL NOTES.

Scientific Improvements.

It has been the good fortune of an American firm, J. W. Queen & Co., of Philadelphia, to furnish an epoch-making contrivance for those who have to use the lantern at varying distances from the screen. The NEW MULTIFOCAL ATTACHMENT, which they have wisely protected by patent, is the most valuable accessory that has ever been offered to the exhibitor and lecturer. It consists of an *achromatic* combination of lenses which is placed just behind the ordinary projection objective. This new accessory, having been prepared after a special formula, is so delicately adapted to its work that its curves help to correct and improve the definition of the objective, but the principal purpose of this new accessory, as expressed by its name, *multifocal*, is to provide many points of image production in the range of the objective, each image point giving a different size of picture for the screen, according to the desired distance. In common experience the lecturer is obliged to set the instrument at one invariable distance from the screen, or else carry several screens of different sizes. Every one can appreciate the relief offered by the Multifocal Attachment, which allows complete liberty of choice for the station of the lantern with only one screen. The exhibitor can now literally "cut his coat according to his cloth," and diminish or increase the size of his picture so as neatly to cover the screen at any distance. It is simply impossible to express the satisfaction and freedom from care which the possession of

this admirable contrivance gives to one whose problem includes night after night the provision for work in halls of many dimensions. But besides having to carry screens of different sizes, the operator needed heretofore three or four pairs of objectives of different powers, a matter of great expense, besides the cumbersome task of packing and unpacking several sets of glasses.

The multifocal attachment not only dispenses with the burden and expense of additional objectives, but also furnishes a picture more nearly PERFECT than the best combination gives without it, never disturbing the equilibrium of the system of lenses, but adding new powers of definition with entire freedom from distortion of lines and color dispersion.

This attachment can be furnished in three graded powers to suit different objectives.

A varying size of picture on the same screen is sometimes desirable. When a portrait or statue is to be shown, it might be desirable to have it relatively larger or smaller than the scale

of the landscape views. To effect this formerly required a change of objectives and an unpleasant interruption; but with the new attachment the statue may be shown life-size or colossal, and a portrait can be reduced to precisely the best size for life-like presentation.

The phantasmagoria effect with the MULTIFOCAL ATTACHMENT is now possible without moving the lantern backward or forward. Simply by increasing the distance of the multifocal system, the picture can be reduced to a disc of light of a few inches diameter, and slowly or rapidly enlarged to cover the whole screen. In scientific demonstrations the operator sometimes needs a sharpened pencil of light or a parallel beam. Such wants are readily met by this wonder-working improvement. All workers with the lantern should know about it, as they will appreciate what can be accomplished with it in covering all perplexities in the distance and size of picture on the screen.

See advertisement in another column.—*Communicated.*

CALENDAR.

Biological Society, Washington.

April 16.—C. W. Stiles, Notes on Parasites: *Tœnia ovilla* in its Relation to Blanchard's Classification; F. V. Coville, The Flora of the High Sierras of California, New Plants from California, Nevada, and Utah; Erwin F. Smith, A Review of Baillon's Botanical Dictionary; J. N. Rose, Mexican Leguminosæ with Notes on Dr. Palmer's Collection.

Society of Natural History, Boston.

April 20.—John Murray, Some Recent Investigations into the Physical and Biological Conditions of the Locks and Fjords of the West of Scotland; E. Adams Hartwell, An Elevated Pot-Hole at Fitchburg, Mass.; George H. Barton, Additional Notes on the Drumlins of Massachusetts.

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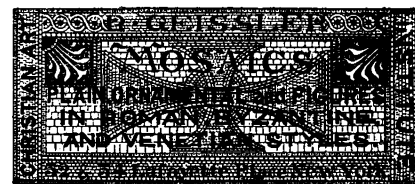
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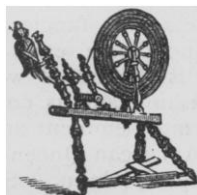
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QUERY.

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First inserted June 19. No response to date.

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